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From: Superintendent
To: Commander, U. S. Naval Forces Europe, (Attn: ADM Lopez,
Commander-in-Chief, Allied Forces Southern Europe)

Subj: SUBMISSION OF RESEARCH PROPOSAL

Encl: (1) Research Proposal by Professor R. Looney
(2) NPS Research Fast Facts
(3) Information for Reimbursable Sponsors

1. A research proposal, enclosure (1), "Caspian Sea Oil: Implications for the U. S. Economy and Naval Forces," by Professor Robert Looney is submitted for consideration.
2. Enclosures (2) and (3) are provided for your information. They provide general information about the Research Program at the Naval Postgraduate School.
3. The point-of-contact for technical matters is Professor Looney, (408) 656-3484 or DSN 878-3484. For administrative purposes, contact Danielle Kuska in the Research Office, (408) 656-2099 or DSN 878-2099. The financial point of contact is Yolanda Forrester in the Comptroller Office, (408) 656-4235 or DSN 878-4235.

D. W. NETZER
By direction

Blind copy to:
Code NS/Lx
Code NS

Prepared by:
Research Office Code 91
21 November 1997

NAVAL POSTGRADUATE SCHOOL
Monterey, CA 93943-5000

PROPOSAL FOR RESEARCH

Submitted to: Adm. Lopez, Commander-in-Chief, U.S. Naval Forces Europe/Commander in Chief, Allied Forces Southern Europe

1. Title: Caspian Sea Oil: Implications for the U.S. Economy and Naval Forces
2. Period of proposed research: 1 January 1998 to 30 September 1998
3. Proposed Budget: \$62,910
4. Principal Investigator:


Robert Looney
Professor of National Security Affairs

Investigators: David Schrady, Ronald Brown

5. Objective: The proposed study will assess the manner in which oil development, production, and export in the Caspian region will affect world oil markets and, indirectly, the United States economy to the year 2010. Six main research tasks are involved. The first is to identify the likely supply and demand balances and price in the world oil market without supplies from the Caspian Sea. The second task is to assess likely production and export volumes from the Caspian region on the assumption that no major crisis interfere with exploration, production or pipeline exportation. Using these results, the third task is to assess the likely impact of various Caspian oil export volumes on the world oil market and the United States economy. The fourth task is to identify the main factors that might result in Caspian oil disruptions. The fifth task is to quantify the economic costs associated with these vulnerabilities. The sixth and final task is, based on the prior analysis, to draw a series of implications for the deployment of forward-based Naval forces in the region.

6. Keywords: Caspian Sea, Oil, Naval Forward Engagement, National Security Strategy

7. DOD Key Technology Area: Modeling and Simulation

8. Recommended Approval:


Frank Petho
Department of National Security Affairs

9. Reviewed:

Danielle Kuska
Research Program Supervisor

10. Approved

David W. Netzer
Associate Provost and Dean of Research

Date

Caspian Sea Oil:
Implications for World Oil Markets and the U.S. Economy

Executive Summary

The objective of the proposed research is to assess the manner in which oil development, production, and export in the Caspian region will affect world oil markets and the United States economy in the period up to 2010. Six main research tasks are involved:

The first task is to identify the likely world oil market supply and demand balances and spot prices in the absence of significant supplies from the Caspian Sea. This task will be based on a series of forecasts made using the Department of Energy's World Oil Model.

The second task will be to identify likely production and export volumes from the region over the period up to 2010. Key considerations will be based on an assessment of exploration and production contracts between international companies and the key countries, feasibility studies, and official forecasts.

Again using the Department of Energy's World Oil Model, the third task will assess the manner in which various oil export volumes from the Caspian would likely impact the world oil market. Here the focus will be not just on price, but also on the contribution Caspian oil is likely to make in providing a cushion against shortfalls in the Middle East.

The fourth task is to identify the main factors that might result in Caspian oil shortfalls. In particular, an assessment will be made of the likely nature and timing of potential conflicts in the region.

The fifth task is to assess the economic costs associated with these vulnerabilities. Again using the Department of Energy's Model the increase in world oil prices stemming from shortfalls in the region will be estimated. In turn, the economic costs associated with these higher prices will be calculated through macroeconomic simulations of the United States economy.

Based on these estimates, the sixth task will draw series of implications for the deployment of forward-based Naval forces. Here, the proposed study will draw on and extend the methodology of our previous study, Forward Engagement Requirements for U.S. Naval Forces: New analytical Approaches (NPS-OR-97-00PR, 23 July 1997) prepared for N-8. That study identified and quantified the linkage between Naval crisis response, oil market stabilization, and the resulting economic benefits to the United States economy.

Background

The National Petroleum Council has estimated that the 1973 and 1979 oil supply shocks cost the U.S. economy a cumulative 2.5% and 3.5% of Gross Domestic Product (GDP), respectively. Each percentage point loss of GDP today would equate to about \$ 75 billion/year. Our dependency on imported oil is much higher today (around 50% of imports) than it was in the mid-1970s and, according to an Energy Information Administration forecast, it may increase to as high as 70% by 2015.

Similarly, the share of oil that can be replaced by other fuels is much lower today than it was in the mid-1970s. Currently two-thirds of all oil is consumed in the transportation sector, where very few substitutes have proven to be economically and technologically viable. In 1975 the transportation sector's share was about 50%. Despite recent developments in electric powered vehicles, this pattern is unlikely to change dramatically during the period under consideration.

Simulations of future oil-supply reductions by OPEC suggest that the cartel will have both the motive and the opportunity to create price shocks and profit from them. Several studies have demonstrated that successive oil price shocks would produce the maximum profit for OPEC producers. The US Department of Energy has shown that the equivalent of a 5.25 million barrel per day supply shortfall, even as soon as the year 2000, would likely cause oil prices to rise to US\$55 per barrel. A recent study simulated a two-year OPEC supply curtailment in the year 2005 similar in size to those of 1973-74 and 1979-80, followed by a very gradual increase in OPEC output through 2010. The study concluded that the shock would boost OPEC revenues by about US\$600 billion, while the U.S economy would lose half a trillion US dollars.

Several analysts have assessed the ability of the Strategic Petroleum Reserve (SPR) to defend against a major, sustained supply curtailment and have concluded that the SPR would be of little help. This result comes about because the US government's strategic oil stocks now amount to 574 million barrels. The total world oil supply shortfall in the typical simulation amounts to 19 billion barrels. Thus, the SPR can replace only three percent of the total supply reduction.

In evaluating United States energy vulnerability, the question has been raised as to whether our recent shift in imports from the Middle East to the Western Hemisphere reduces the risk of an oil import disruption. Currently, the Middle East accounts for nearly half of the world's interregional oil exports, has the lowest production cost, the biggest growth potential based on its proven reserves, and contains virtually all the world's readily available spare production capacity.

Thus, the Middle East is and will remain a key determinant in world oil supplies and prices. Because oil is now truly a global commodity with global prices and price mechanisms, any individual country's independence of Middle East oil imports is irrelevant to the country's oil price structure. This was clearly demonstrated during the Persian Gulf crisis of 1990, when world oil prices rose everywhere at similar rates.

The Middle East's spare capacity currently totals 3 million barrel per day (b/d), or just 4% of world oil production; two thirds of it are located in one country, Saudi Arabia. This is less than half the spare capacity that existed during the 1980s. There is no significant spare capacity outside the Middle East.

In view of the world's increasing dependence on Persian Gulf oil, what can the United States do to reduce its vulnerability to disruption in the supply of oil from this region? Most

experts agree that the best strategy is to continue to develop sources of oil other than the Persian Gulf. This is partly a question of developing new technologies to open hitherto inaccessible areas, such as deep-water continental shelf, and to improve extraction rates from existing wells. It is also a question of political and economic steps to open known economic sources of oil, of which the Caspian Sea region is the most promising. Caspian oil and gas deposits are extensive and it might be possible to extract them economically, although they are far from major markets and export through pipelines will be expensive and risky.

Relevance of the Caspian Sea

The Caspian Sea region contains the third largest reserve of oil and natural gas in the world, behind the Gulf region and Siberia. Drilling for oil in the region is not new. Oil was a major source of hard currency for the former Soviet Union but drilling methods were technologically inferior compared with Western firms when it came to large-scale oil exploration. This inhibited Soviet exploration in the Caspian region. Western firms for decades had longed for the opportunity to exploit the former Soviet Empire's massive oil reserves but the Cold War relationship did not allow this option. When the Soviet Union implemented Perestroika and Glasnost in the mid-1980s, its oil exploration sector was poised to reap benefits from the West.

The breakup of the Soviet Union, however, put a hold on these plans, as several nations emerged in the former Soviet lands around the Caspian Sea. The major issue regarding oil exploration in the region is a question of how best to deliver the oil to world markets. The Caspian Sea area is landlocked, thus the only way to efficiently transport the oil to world markets is via pipeline. One area completely dependent on pipelines is the region around Azerbaijan on the southwestern shores of the Caspian Sea. Another is in western Kazakhstan, where one of the world's largest oil fields was discovered in 1979. The Soviets had been drilling in the Tengiz region, in the northeastern section of the Caspian Sea, for many years. The Tengiz discovery dramatically altered oil exploration potential for the region as a whole.

If the forecasts of many western oil experts prove correct, the development of the Caspian region could help change global energy trading patterns within 10 to 15 years. The center of gravity of the world's oil markets is shifting rapidly east to the fast-growing economies of China and Southeast Asia. A recent study by oil industry consultants, Wood Mackenzie, predicted that every Asian country except Brunei will be a net oil importer by 2015. China became a net importer in 1993, and is expected to have an increasing impact on world oil markets.

The Caspian is increasingly seen as a logical source to meet much of that growing demand, especially since many Asian countries are keen to diversify away from their dependence on the Gulf. Optimists believe it will only be a matter of time before the Caspian region experiences the sort of oil boom that would enable it to become a significant global supplier.

Transit Risks

In the international arena increased reliance on pipeline transportation of crude exports has rendered oil supplies more vulnerable to disruption. Except for the Suez Canal closure in 1956, all post World War II oil disruptions involved only the oil-producing countries themselves.

In the future, there will be an additional risk -- the pipeline transit countries. This could be of particular importance in the Caspian Sea region. By 2010, the region may export 3-4 million barrels per day (b/d), all of which will transit by pipeline through other countries to maritime harbors. Several of these transit countries and regions, such as Chechnya, Dagestan, Georgia, Armenia, and Azerbaijan, are either politically unstable or have territorial disputes or

other conflicts with each other. Thus, temporary disruptions in the transit of Caspian oil exports are a real, new risk.

In sum, political stability in the Caspian region and the region's ability to maintain security of production and delivery will prove to be the most important factors determining the ultimate success of oil exploration in this part of the world. Clearly, the intricate political climate of the region is the dominant factor that is determining the way in which oil will be delivered to world markets. Additionally, the nations that control the pipeline will be able to exert substantial control over most aspects of oil production or distribution.

It is not an exaggeration to say that whatever happens will have affects far beyond the Caspian region. The price of oil will, inevitably, be altered. The oil shocks in the 1970s demonstrated the vulnerability of nations reliant on oil imports. The shocks spurred inflation and recession in many industrialized nations and are seen as a major catalyst of the debt crisis that emerged in the early 1980s. The importance of stability in the world's oil markets cannot be overstated. Oil from the Caspian region can have dramatic effects on the world market. OPEC levels are near full utilization and their share of world markets is growing. Another major source beyond the Gulf region may allow a "safety" if instability engulfs the Arabian region.

Proposed Research

The proposed research will assess the manner in which oil development, production, and export in the Caspian region will affect world oil markets and, indirectly, the United States economy to the year 2010. Six main research tasks are involved. The first is to identify the likely supply demand balances and price in the world oil market without supplies from the Caspian Sea. The second task is to assess likely production and export volumes from the Caspian region on the assumption that no major crisis interfere with exploration, production or pipeline exportation. Using these results, the third task is to assess the manner in which various oil export volumes from the Caspian would likely impact on the world oil market and the United States economy. The fourth task is to identify the main factors and their timing that might result in Caspian oil shortfalls. The fifth task is to quantify the economic costs associated with these vulnerabilities. The sixth and final task draws on these findings to draw implications for the deployment of forward-based Naval forces. What crisis are likely and how large are the economic benefits associated with timely naval crisis response? How might these findings modify existing Naval force plans for the region?

The proposed study will build on an earlier study, Forward Engagement Requirements for U.S. Naval Forces: New analytical Approaches (NPS-OR-97-00PR, 23 July 1997) prepared for N-8. A main finding of that study was that through reducing and stabilizing world oil prices, Naval forward engagement and crisis response have averted sizable losses in output, employment and standard of living for the United States and other nations. Although occurring in much different oil market environments and under different political circumstances, a common thread was found to run through the crises examined. In general, oil prices decline a day or so after naval crisis response. This decline rapidly spreads through the future markets, providing the basis for computing the economic ramifications of Naval forward engagement and crisis response.

In quantitative terms, that study found the economic benefits of forward- engaged Naval forces to be significant. Measured in Gross Domestic Product, these amounted to: \$97 11.20 billion for the Gulf Shipping Crisis of January 1987; \$97 55.20 billion for the Gulf War of August 1990; and \$97 11.7 billion in the case of the Iraq-Kuwait Border Confrontation of October 1994. In short, that study showed a linkage between oil prices and Naval forward engagement and crisis response. Oil prices have significant and lasting impacts on the U.S. economy and, indeed, on the economies of all industrialized nations. Naval crisis response

eases oil traders' concerns, thereby reducing the premium which traders are willing to pay for immediate possession of oil. Their reaction is due in part to their assessment of the capabilities and the track record of U.S. commitment, which once undertaken is carried through to successful conclusion.

Methodology

By its nature, the methodology used in the proposed research will differ somewhat from the earlier Forward Engagement Requirements Study. The Forward Engagement Requirements Study examined three historical cases and was, therefore, able to utilize an extensive series of oil futures prices. These prices played a key role in establishing counterfactual forecasts of oil prices that were likely to occur in the absence of naval crisis response. Because of its future time frame, the proposed study will need to be based on oil spot prices:

- Oil price forecasts to the year 2010 will be estimated using the World Oil Market Model developed by the Department of Energy. Here the study will make various forecasts of anticipated output and export volumes of Caspian-based oil. These forecasts will be combined with anticipated demand to generate the "Caspian Effect" on world oil markets.
- Next, several crisis scenarios will be developed in which oil supplies from the Caspian region are significantly reduced. Again using the Department of Energy Model, a "Crisis Price Impact" will be calculated.
- In order to determine the magnitude of the economic losses associated with these higher oil prices, several macroeconomic simulations of the United States economy will be undertaken. Here we will be using the model of the United States economy developed by Professor Ray C. Fair at Yale University. Using the "Crisis Price Impact" as an input to the model, estimates will be made of the costs associated with Caspian oil shortfalls.

Based on these estimates, the study will conclude with a series of implications for the deployment of forward-based Naval forces. In this regard the study will extend the findings of our previous study Forward Engagement Requirements for U.S. Naval Forces: New analytical Approaches (NPS-OR-97-00PR, 23 July 1997) prepared for N-8. That study has been widely circulated, critiqued, and well received. While that study dealt with historical cases, the methodology and analysis provided a starting point for examining future crisis responses. A main objective of the current study will be to see the extent to which this approach can be productively applied to possible future events.

Output Expected

The proposed research will culminate in a report detailing the main findings. A full set of briefing slides will also be provided as well as all documentation and backup materials and instructions for replicating the main results.

Time and Cost

The economic analysis section of the FY98 research will take 1.0 academic quarters to complete, while the naval analysis will require 0.3 quarter's work. While the research is scheduled to carry through the fiscal year, preliminary reports and briefing slides can be made available to fit the needs of the sponsor. The analysis will require additional equipment, databases, software, and supplies at a total cost of approximately \$6,000. Travel money has been set aside for a briefing in Italy and data gathering in Washington.